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Mathematical Computation of Fuzzy Statistics for Sensory Evaluation

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Abstract

Sensory evaluation is an essential need for accepting processed food products having desired quality specifications. Human perceived sensation depends on physiological and physical properties of food as well as demographic characters of consumers. In this paper, a mathematical computation method of fuzzy statistics for sensory evaluation is proposed. It illustrates the quality of sensory variables such as color, texture, flavor, taste etc. of a product with consumers' demographic characters on a hedonic scale.

Keywords: Fuzzy set, fuzzification, de-fuzzification, performance measures, hedonic scale.

1. Introduction

Fuzzy sets, introduced by Zadeh [14] in 1965 as a mathematical way to represent vagueness in linguistics, can be considered as a generalization of classical set theory. Fuzzy number is an extension of the interval of confidence on uncertainty. Instead of considering the interval of confidence at one level, it is considered at several possible levels and more generally at different levels from 0 to 1. The fuzzy evaluation considers the maximum presumption to be at 1 and the minimum presumption to be at 0. However, one must not confuse fuzzy numbers with random numbers. If there is heavy rain and strong wind, then there must be severe flood. Heavy, strong and severe are the examples of fuzzy set. Rain and wind are uncertainty variables. Randomness and uncertainty are two very different and important concepts which can be used together but should not be confused.

Fuzzy sets support a flexible sense of membership of elements to a set, while in set theory only an element either belongs to a set or does not belong to a set. In the fuzzy set theory, many degrees of membership between 0 and 1 are obtained. Thus membership function $\mu_A(x)$ is associated with a fuzzy set A so that the function maps every element of the domain X to the interval [0, 1], i.e., $\mu_A(x) : X \to [0,1]$ where $A = \{(x, \mu_A(x)), x \in X\}$. If people can use the membership function to express the